

**REMARKS / ARGUMENTS**

This application is believed to be in condition for allowance because the claims, as amended, are believed to be non-obvious and patentable over the cited references. The following paragraphs provide the justification for this belief. In view of the following reasoning for allowance, the Applicant hereby respectfully requests further examination and reconsideration of the subject patent application.

**1.0 Rejections under 35 U.S.C. §112:**

The Office Action of December 28, 2004 rejected claims 10, 21, and 30 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In response the Applicant has deleted dependent claims 10, 21, and 30, with the subject matter of claims 9-10 being partially incorporated into claim 1, and the subject matter of claim 21 being partially incorporated into claim 20. In addition, the wording of the aforementioned amended claims (claim 1 and claim 20), now makes clear the use of two thresholds for use in dividing the image into a set of foreground pixels and a set of background pixels.

Therefore, in view of the aforementioned amendment, the Applicant respectfully suggests that the rejection under 35 U.S.C. §112, second paragraph, is no longer valid, and respectfully requests withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

**2.0 Rejections under 35 U.S.C. §103:**

The Office Action rejected claims 1-9, 11-20, 22, 23, 25-29 and 31-33 under 35 U.S.C. §103(a) as being unpatentable over Shosun, et al. ("**Shosun**," U.S. Patent 6,670,986), in view of Steinkirchner ("**Steinkirchner**," U.S. Patent 5,392,365)

In order to deem the Applicant's claimed invention unpatentable under 35 U.S.C. §103(a), a prima facie showing of obviousness must be made. However, as fully explained by the M.P.E.P. Section 706.02(j), to establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, ***the prior art reference (or references when combined) must teach or suggest all the claim limitations.***

Further, in order to make a prima facie showing of obviousness under 35 U.S.C. 103(a), all of the claimed elements of an Applicant's invention must be considered, especially when they are missing from the prior art. If a claimed element is not taught in the prior art and has advantages not appreciated by the prior art, then no prima facie case of obviousness exists. The Federal Circuit court has stated that it was error not to distinguish claims over a combination of prior art references where a material limitation in the claimed system and its purpose was not taught therein (*In Re Fine*, 837 F.2d 107, 5 USPQ2d 1596 (Fed. Cir. 1988)).

## **2.1 Rejection of Claims 1-8 and 11-12:**

In general, the Office Action rejected independent claim 1 under 35 U.S.C. §103(a) based on the rationale that the ***Shosun*** reference discloses prior art which describes an "image capturing method designed to increase the resolution of a CCD sensor by taking multiple pictures of a document and then combining the images. Lateral jittering is imparted on the CCD sensor through the use of a piezoelectric driver...", with an "improved version of this method" being disclosed by ***Shosun***. The Office Action then continued by suggesting that ***Steinkirchner*** disclosed thresholding, and that "thresholding a two-tone image into two colors is a form of sharpening; sharpening is de-blurring." The Office Action then concluded that "it would have been obvious to one having ordinary skill

in the art at the time of the invention to include post processing procedures disclosed by Steinkirchner to a text document captured by the method disclosed by Shoshan.”

However, the Applicant believes that the references cited by the Office Action fail to disclose the elements of the invention recited in claim 1. In fact, the Applicant believes that Office Action has misinterpreted the elements of claim 1 in light of the teachings provided in the specification. In particular, it should be noted that claim 1, prior to the amendment provided above in the Listing of Claims, recited the following elements:

imparting lateral jittering between a digital imaging device and the text document;

obtaining multiple laterally-displaced digital images of all of the text document segment;

In view of the detailed description provided by the specification, it was intended that these elements describe a system wherein digital images were captured at various points **during** the lateral jittering between the digital imaging device and the text document. In other words, as described in paragraphs [0044] and [0045] of the Applicants published patent application (United States Patent Application 20030063814), a plurality of images are captured at various positions while the jittering is in motion, and without regard to whether the jittering has caused the imaging device to reach a particular point relative to the text document. In particular, paragraphs [0044] and [0044] recite the following language:

“[0044] FIG. 5 is a graph illustrating 16 relative positions (i.e., the trajectory) of a single pixel sensor of the digital camera provided by simultaneous bi-directional lateral translation. ***The relative positions of the single pixel center or locus are indicated by asterisks relative to normalized X- and Y-axis scales in which the unit distance represents one VGA pixel width along the corresponding axis.***”

"[0045] ***The relative positions represent the instants at which images or samples are acquired by the digital camera during the lateral translation*** (e.g., bi-directional oscillation). In this illustration, a cyclic lateral translation of the single pixel is indicated by lines connecting the successive positions. Such cyclic lateral translation can correspond, for example, to operation of camera jitter mechanism 58 with transverse oscillators 70 and 72." (emphasis added)

Consequently, it should be clear that the digital imaging device is capturing images at fractional pixel shifts ***during*** the relative motion between the imaging device and the text document. In some cases these fractional pixel shifts resulting from the claimed jittering may coincidentally correspond to a whole pixel shift; however, ***there are no fixed points*** or pixel shifts that are required to be made prior to acquiring any of the images. (See also FIG. 5 and FIG. 6).

In stark contrast, the point of the ***Shosun*** reference, and of all of the "prior art" cited by the ***Shosun*** reference, is that there are ***very precise shifts*** of a color CCD sensor which are designed to allow each point of a scene or object to be captured by CCD cells of differing color sensitivities, and ***which are predetermined*** before each image is captured. Specifically, the CCD shifting described by ***Shosun*** is designed to produce a set of RGB color separations of an object, which remains completely motionless relative to the camera, so that the color separations can be combined into a higher resolution image. Note that the pixel shifts described by are designed to be ***exactly*** 1-pixel in distance so that there is a one-to-one correspondence between points in the object to be imaged to specific adjacent cells of the CCD sensor. This process is described in a detailed example in col. 6, lines 18-48.

Consequently, it should be clear that the system described by ***Shosun*** requires precise movement of the CCD sensor to a specific location, where the CCD stops, captures an image, and moves to the next ***specific*** location prior to capturing another image.

Again, in contrast to **Shosun** technique, the Applicant has described and claimed a system wherein the point that the image is captured during jittering does not matter, so long as the point at which the image was captured, can be computed at or after the time that the image was captured. Further, it should also be clear that unlike the **Shosun** technique, the amount of motion of the digital imaging device relative to the text document is some random fractional distance, within a range of about zero to one pixel or so (in a positive or negative direction x and/or y direction) for each captured image.

Further, it should also be clear that the precise "micro-movement" of the CCD sensor described by **Shosun** are "either expensive and/or complicated to manufacture." (see col. 2, lines 4-5). Such precise micro-movement is not required by the Applicant's claimed invention. Consequently, one advantage of the Applicant's claimed invention is that it does not require precise micro-movements which are expensive to implement because the Applicant simply captures an image, and then determines the position at which that image was captured.

However, because it appears that the Office Action did not interpret the limitation of claim 1 in the manner described above, the Applicant has amended the language of claim 1 to make this point more clear. In particular, claim 1 now recites that there is a "continuous lateral jittering between a digital imaging device and the text document" during which jittering motion "multiple laterally-displaced digital images" are obtained. The "fractional pixel offset positions at which each image was obtained" are **then determined** after each image has been captured. Clearly, this claimed element is neither described nor in any way rendered obvious by the **Shosun** reference, nor by any of the "prior art" cited therein.

In addition, claim 1 has been further amended to clarify the de-blurring process that was also the subject of dependent claims 9 and 10. In particular, claim 1 now also recites that the "de-blurring the enhanced resolution representation of the text document by thresholding the enhanced resolution representation into either one of two pixel luminance levels, representing foreground and background pixels, with the foreground pixels

corresponding to text in the text document.” This is simply not the process described by **Steinkirchner** for edge detection of text in a document.

Thus, it is clear that the present invention, as claimed by independent claim 1 includes elements not taught in the proposed **Shosun - Steinkirchner** combination reference. Consequently, the rejection of independent claim 1, as amended, and of dependent claims 2-8 and 11-12, under 35 U.S.C. §103(a) is not proper. Therefore, the Applicant respectfully requests reconsideration of the rejection of claims 1-8 and 11-12 under 35 U.S.C. §103(a) in view of the novel language of claim 1, as amended. In particular, claim 1 now recites the following novel language:

“A text document capture method for digitizing a text document segment in printed form, comprising:

imparting a **continuous lateral jittering** between a digital imaging device and the text document;

obtaining multiple laterally-displaced digital images of all of the text document segment **during the continuous lateral jittering and determining fractional pixel offset positions at which each image was obtained**;

forming from the multiple laterally displaced images an enhanced resolution representation of the text document **as a function of the fractional pixel offset positions**; and

de-blurring the enhanced resolution representation of the text document **by thresholding the enhanced resolution representation into either one of two pixel luminance levels**, representing foreground and background pixels, with the foreground pixels corresponding to text in the text document.” (emphasis added)

## 2.2 Rejection of Claims 13-20, 22, and 23:

In general, the Office Action rejected independent claim 13 under 35 U.S.C. §103(a) over the proposed **Shosun - Steinkirchner** combination reference using virtually the same rationale as discussed above with respect to the rejection of claim 1. However, independent claim 13 has been amended to include limitations similar in scope to the limitations of claim 1, as discussed above.

In particular, independent claim 13 now clarifies the elements relating to image capture at fractional offsets which are not predetermined. For example claim 13 recites the following language:

“A text document capture system for digitizing with a digital imaging device a segment of a text document in printed form, comprising:

a jittering mechanism for imparting a **continuous lateral jittering** between the text document and the digital imaging device **while it obtains multiple laterally-displaced digital images** of all of the text document segment, **said lateral jittering moving through a distance being on the order of around one pixel;**

**a pixel offset determination system for determining fractional pixel offset positions at which each digital image was obtained;**

and a processing system for forming an enhanced resolution representation of the text document segment from the multiple laterally displaced images **as a function of the pixel offset positions corresponding to each digital image**, and for de-blurring the enhanced resolution representation.” (emphasis added)

As with claim 1, the elements recited above are not disclosed or in any way rendered obvious by the proposed **Shosun - Steinkirchner** combination reference. Therefore, because the present invention, as claimed by independent claim 13 includes elements not taught in the proposed **Shosun - Steinkirchner** combination reference, the

rejection of independent claim 13, as amended, and of dependent claims 14-20, 22, and 23, under 35 U.S.C. §103(a) is not proper. Therefore, the Applicant respectfully requests reconsideration of the rejection of claims 13-20, 22, and 23 under 35 U.S.C. §103(a) in view of the novel language of claim 13, as amended, as cited above.

### 2.3 Rejection of Claims 25-29 and 31-32:

In general, the Office Action rejected independent claim 25 under 35 U.S.C. §103(a) over the proposed **Shosun - Steinkirchner** combination reference using the same rationale as discussed above with respect to the rejection of claims 1 and 13. However, independent claim 25 has been amended to include limitations similar in scope to the limitations of claim 1 and claim 13, as discussed above.

In particular, independent claim 25 now clarifies the elements relating to image capture at fractional offsets which are not predetermined. For example, claim 25 recites the following language:

“In a computer-readable medium, text document capture software for digitizing with a digital imaging device a text document segment in printed form, comprising:

software for imparting controlled ***continuous lateral jittering between the text document and the digital imaging device;***

software for obtaining multiple laterally-displaced digital images of all of the text document segment ***at a plurality of non-predetermined fractional pixel offsets*** relative to an original position of the text document relative to the digital imaging device;

software for ***determining the fractional pixel offsets of each digital image;***

software for forming an enhanced resolution representation of the text document segment from the multiple laterally displaced images ***as a function of the fractional pixel offsets;*** and



software for de-blurring the enhanced resolution representation.”  
(emphasis added)

As with claims 1 and 13, the elements recited above are not disclosed or in any way rendered obvious by the proposed **Shosun - Steinkirchner** combination reference. Therefore, because the present invention, as claimed by independent claim 25 includes elements not taught in the proposed **Shosun - Steinkirchner** combination reference, the rejection of independent claim 25, as amended, and of dependent claims 26-29 and 31-32, under 35 U.S.C. §103(a) is not proper. Therefore, the Applicant respectfully requests reconsideration of the rejection of claims 25-29 and 31-32, under 35 U.S.C. §103(a) in view of the novel language of claim 25, as amended, as cited above.

### 2.3 Rejection of Claim 33:

In general, the Office Action rejected independent claim 33 under 35 U.S.C. §103(a) over the proposed **Shosun - Steinkirchner** combination reference using the same rationale as discussed above with respect to the rejection of claims 1 and 13. However, independent claim 33 has been amended to include limitations similar in scope to the limitations of claim 1 and claim 13, as discussed above.

In particular, independent claim 33 now clarifies the elements relating to image capture at fractional offsets which are not predetermined. For example, claim 25 recites the following language:

“An image capture method for digitizing a spatially piecewise constant image, comprising:

imparting a **continuous lateral jittering between a digital imaging device and the spatially piecewise constant image**;

obtaining multiple laterally-displaced digital images of all of the spatially piecewise constant image **during the continuous later jittering**;

***computing a fractional pixel offset distance representing a pixel capture position for each digital image;***

forming from the multiple laterally displaced images an enhanced resolution representation of the spatially piecewise constant image ***as a function of the computed fractional pixel offset distances;*** and

de-blurring the enhanced resolution representation of the spatially piecewise constant image.” (emphasis added)

As with claims 1 and 13, the elements recited above are not disclosed or in any way rendered obvious by the proposed ***Shosun - Steinkirchner*** combination reference. Therefore, because the present invention, as claimed by independent claim 33 includes elements not taught in the proposed ***Shosun - Steinkirchner*** combination reference, the rejection of independent claim 33, as amended, under 35 U.S.C. §103(a) is not proper. Therefore, the Applicant respectfully requests reconsideration of the rejection of claim 33 under 35 U.S.C. §103(a) in view of the novel language of claim 33, as amended, as cited above.

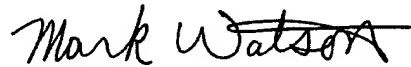
### **3.0 Rejection of Claim 24:**

The Office Action rejected dependent claim 24 under 35 U.S.C. §103(a) as being unpatentable over ***Shosun*** in view of ***Steinkirchner***, and in further view of Reinsh, (“***Reinsh***” U.S. Patent 5,083,313). However, it should be noted that claim 24 is dependent from independent claim 13, which, as discussed above, is patentable under 35 U.S.C. §103(a). Consequently, because there is no valid rejection of the parent claim (claim 13), the use of an additional reference to address a particular feature of a dependent claim is insufficient to provide valid grounds for rejection of the dependent claim (claim 24). Consequently, as there is no valid rejection of claim 13, the Applicants respectfully requests reconsideration of the rejection of claim 24 under 35 U.S.C. §103(a) based on the novel language of independent claim 13.

**CONCLUSION**

In view of the above discussion, it is respectfully submitted that claims 1-8, 11-20, 22-29 and 21-33 are in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of claims 1-8, 11-20, 22-29 and 21-33 and to pass this application to issue at the earliest opportunity. Additionally, in an effort to further the prosecution of the subject application, the Applicant kindly invites the Examiner to telephone the Applicant's attorney at (805) 278-8855 if the Examiner has any additional questions or concerns.

Respectfully submitted,



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